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Zodiacal Radiants of Fireballs. By W. F. Denning.

I have previously pointed out that the majority of large fireballs observed *move slowly, are directed from radiants in the western half of the sky and in the neighbourhood of the horizon* (*Monthly Notices*, vol. liv. pp. 342 and 539). They appear, in fact, to form a special class of bodies, and to offer well-marked distinctions to the ordinary shower-meteors generally moving swiftly from radiants high in the eastern sky.

To what has been already said on this subject I may now add that the majority as well as the most prominent of the fireball radiants apparently cluster in a girdle conforming approximately with the position of the ecliptic. This is not an inviolable law of distribution, for many exceptions to it can be found, but it agrees with the weight of the evidence, and much of this is of a very suggestive and significant kind.

There are probably few persons who have occupied themselves in the comparison and assortment of well-marked fireball radiants, but those who have will remember the brilliant Cancrids of January, Sextantids of February, β Leonids of March, Virginids and Librids of April, Scorpiids and Sagittarids of June, Aquilids, Capricornids and Aquarids of July and August, Piscids of September, Arietids of October, Taurids of November, and Geminids of December.

I have compiled the following table as representing approximately the facts observed :—

	R.A. Fireball Radiants. °		Chief Positions. ° °
Jan.	110	Geminids, Cancrids	97 + 29 110 + 24 132 + 21
Feb.	140	Sextantids, Hydrids	145 + 5 148 − 12
Mar.	170	Sextantids, β Leonids	175 + 10
April	200	Virginids, Librids	208 − 10 216 − 8
May	230	Serpentids, Scorpiids, Ophiuchids	228 − 3 235 − 15 244 + 7
June	260	Scorpiids, Sagittarids	250 − 20 269 − 23

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	R.A. Fireball Radiants.		Chief Positions.
	°		° °
July	290	Antinoids, Aquilids	282 − 13 285 − 21 296 − 0 303 + 12
Aug.	320	Capricornids, Aquarids	303 − 12 317 − 11 326 − 9 339 − 12
Sept.	350	Piscids	348 ± 0 355 + 5 2 − 3 6 + 12
Oct.	20	Piscids, Arietids	14 + 7 33 + 18 40 + 20
Nov.	50	Arietids, Taurids	48 + 22 55 + 17 62 + 22
Dec.	80	Aurigids, ζ Taurids, Geminids	77 + 32 80 + 23 108 + 25

It is not to be assumed from the table that the approximate R.A. of the principal fireball-radiants exhibits a regular arithmetical increase of 30° per month, but that this rate of progression seems best to generally satisfy the observations. The R.A. given is chiefly based on the very well-defined April fireball-radiants in Virgo and Libra, the Scorpiid radiant in June, the Capricornid radiant in August, the Arietid radiant in October, and the Taurid radiant in November. Any system of R.A.'s for the different months, to be conformable with the principal showers of large meteors, must accommodate these specially productive and well-known systems.

In striking corroboration of the preference for the zodiac shown by fireball-radiants it may be mentioned that the well-defined positions in *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, and *Aquarius* are visible, notwithstanding the circumstance that they are below the equator, and therefore unfavourably presented in northern latitudes. Yet they form a well-marked girdle along the zodiac, while a similar distance north of the equator few such radiants are manifested. Again, if we turn to the region embraced by *Pisces*, *Aries*, *Taurus*, *Gemini*, *Cancer*, and *Leo* there

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appears the same extensive girdle, while south of the equator not many fireball radiants are known. But, as before stated, the zodiacal radiants of fireballs are not nearly inclusive of all such systems, for there are instances in *Cygnus* (293° + 52° August, and 304° + 54° September), *Cepheus* (330° + 57° January–March, and 335° + 71° August–September), *Cassiopeia* (20° + 57° April), *Draco* (262° + 63° October), *Pegasus* (336° + 35° September), *Ursa Major* (213° + 53° August), *Perseus* (47° + 44° April), &c., &c., but the fireballs from the region of the zodiac seem to have been the most numerous, and the radiants derived from them more satisfactory than the others.

These large meteors would therefore appear to be revolving not only in direct orbits, but to exhibit small inclinations like the Jovian family of comets.

It is most important that large meteors, whenever and wherever they appear, should be accurately recorded in order to acquire the material which is absolutely necessary in an investigation of this kind. In the present state of our knowledge it is difficult to draw certain conclusions, the available data being not only deficient, but often vitiated by unreasonably large errors. In view of the suggestive and interesting questions involved, it is hoped observers of the brilliant and isolated forms of meteoric phenomena offered by fireballs will be particular in registering their apparent paths amongst the stars, and durations of flight, so that trustworthy results may accumulate more rapidly than in previous years

Bristol: 1897 *April* 11.

The New Thompson Photographic Telescope at the Royal Observatory, Greenwich.

The Astronomer Royal announced that the new instrument, presented by Sir Henry Thompson, had been mounted on the Physical Observatory under the Lassell Dome, and was practically completed and in working order, though further adjustment of the object-glass would be required.

He exhibited some photographs of the Moon, (i) taken at the principal focus and giving an image about 2½ inches in diameter, (ii) enlargements made at the telescope by the use of a secondary magnifier, giving an image 11½ inches in diameter.